EOS Mission Support Network Performance Report

This is a monthly summary of EMSnet performance testing for April 2005 -- comparing the measured performance against the requirements.

Highlights:

- The GSFC Performance Test Host ("GSFC-PTH") was restored in April (had gone down during March, so results from GDAAC were used). The PTH node is outside the ECS firewall, and generally got higher performance than from GDAAC. The rating to EDC improved as a result,
- The "Integrated measurements" continue to be used as the basis for the ratings (where available). However, they are no longer as useful as previously, as some flows transitioned to PIP are no longer included in the measurements (e.g., LaRC, NSIDC)
- Mostly stable performance.
  - ERSDAC to EDC problem fixed
- Outstanding Issues:
  - ASF to NSIDC flow
  - LaRC to GSFC Backhaul requirement is not valid
- Significant changes in testing are indicated in Blue, Problems in Red

Ratings:

Rating Categories:

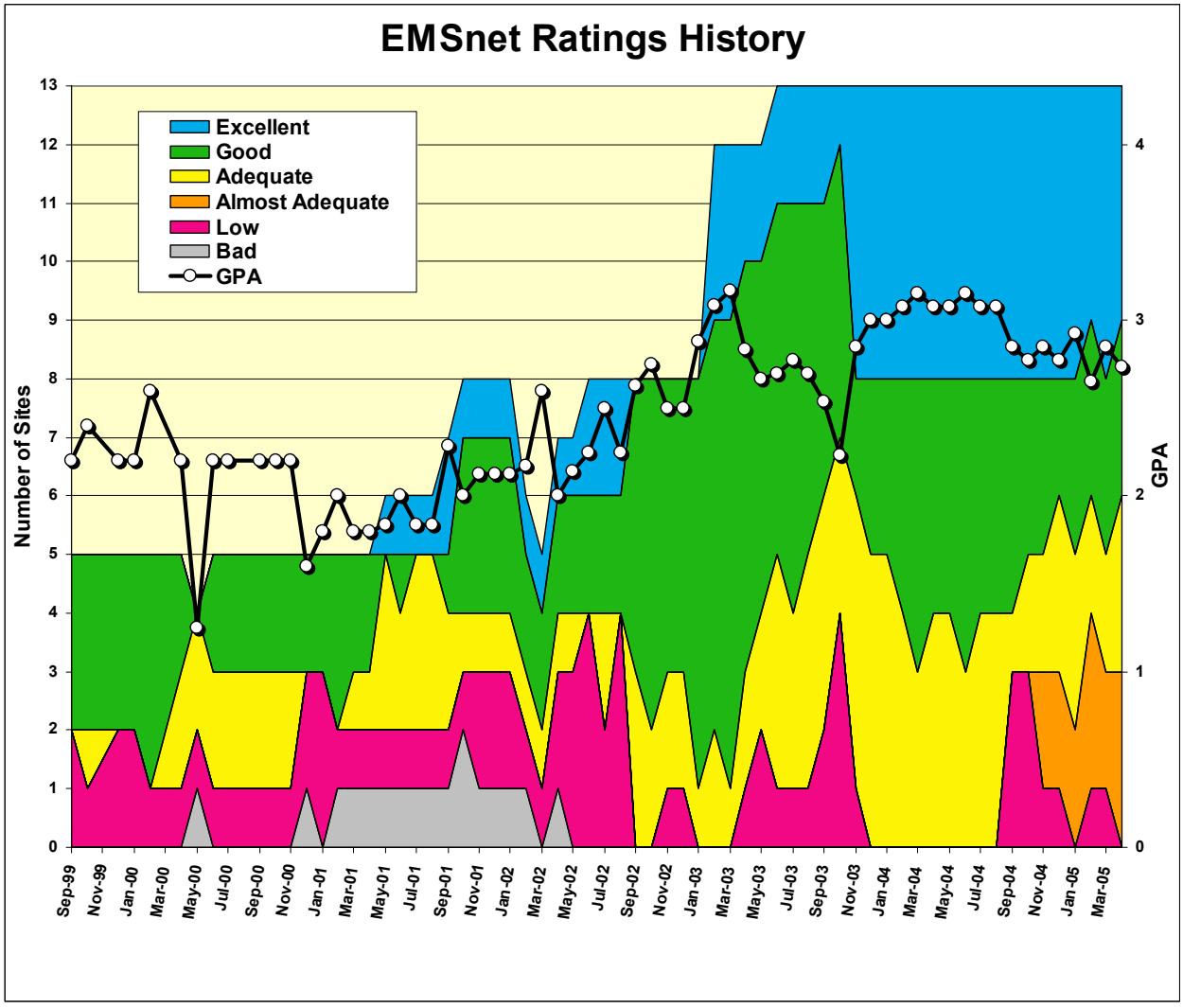
Rating	Value	Criteria
Excellent:	**4**	**Total Kbps** > Requirement * 3
Good:	**3**	1.3 * Requirement <= **Total Kbps** < Requirement * 3
Adequate:	**2**	:Requirement < **Total Kbps** < Requirement * 1.3
Almost Adequate:	**1.5**	Requirement / 1.3 < **Total Kbps** < Requirement
Low:	**1**	Requirement / 3 < **Total Kbps** < Requirement / 1.3
Bad:	**0**	**Total Kbps** < Requirement / 3

Where Total Kbps = Integrated Kbps (where available)
Else = User Flow + iperf monthly average

Ratings Changes:

Upgrades: ↑
GSFC → EDC: Low → **Almost Adequate**

Downgrades: ↓
JAXA → US: Excellent → **Good**
GSFC → NSIDC: Good → **Adequate**



The chart above shows the number of sites in each classification since EMSnet testing started in September 1999. Note that these ratings do NOT relate to absolute performance -- they are relative to the EOS requirements.

EMSnet Sites

Network Requirements vs. Measured Performance

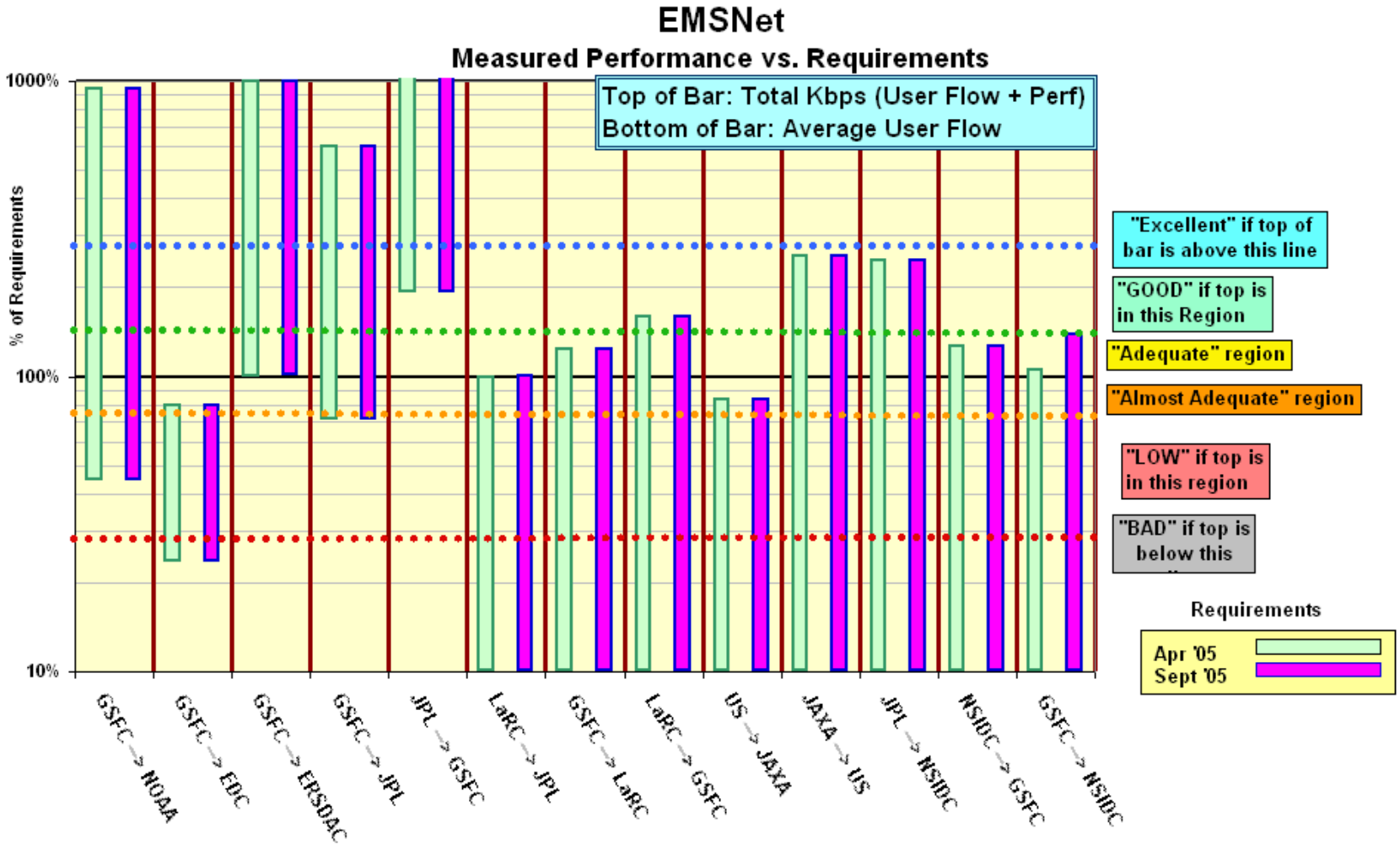
April 2005		Requirements (kbps)		Testing							
Source → Destination	Team (s)	Current Apr-05	Future Sep-05	Source → Dest Nodes	Avg User Flow kbps	iperf Avg kbps	Total Avg kbps	Integrated kbps	Rating re Current Requirements Apr-05	Rating re Current Requirements Prev	Rating re Sep-05
GSFC –> ASF	QuikScat, Radarsat	n/a	n/a	GSFC-CSAFS → ASF	0	1267	1267	1267	n/a	n/a	n/a
ASF –> JPL	QuikScat, Radarsat	n/a	n/a	ASF → JPL-SEAPAC	80	1344	1424		n/a	n/a	n/a
GSFC –> NOAA	QuikScat	189	189	GSFC-CSAFS → NESDIS	83	2930	3013	2930	Excellent	E	Excellent
GSFC –> EDC	MODIS, LandSat	285361	285361	GSFC-PTH → EDC PTH	67210	226648	293858	227326	A A	L	LOW
GSFC –> ERSDAC	ASTER	568	568	GDAAC → ERSDAC	n/a	15341	15341		Excellent	E	Excellent
GSFC –> JPL	ASTER, QuikScat, MLS, etc.	1275	1272	GSFC-CSAFS → JPL-SEAPAC	906	7553	8459	7692	Excellent	E	Excellent
JPL –> GSFC	AMSR, etc.	1155	1155	JPL-PODAAC → GDAAC	2208	11267	13474		Excellent	E	Excellent
LaRC –> JPL	TES, MISR	40311	40311	LDAAC → JPL-TES	n/a	40234	40234	40269	A A	A A	A A
GSFC –> LaRC	CERES, MISR, MOPITT	58456	58456	GDAAC → LDAAC	n/a	72690	72690	72694	Adequate	A	Adequate
LaRC –> GSFC	MODIS, TES	31695	31695	LDAAC → GDAAC	n/a	50439	50439	50439	GOOD	G	GOOD
US –> JAXA	QuikScat, TRMM, AMSR	1665	1665	GSFC-CSAFS → JAXA	66	1227	1293	1392	A A	A A	A A
JAXA –> US	AMSR	512	512	JAXA → JPL-SEAPAC	0	1308	1308		GOOD	E	GOOD
JPL –> NSIDC	AMSR	1342	1342	JPL-PODAAC → NSIDC SIDADS	n/a	3333	3333		GOOD	G	GOOD
NSIDC –> GSFC	MODIS, ICESAT, QuikScat	13326	13326	NSIDC DAAC → GDAAC	n/a	16916	16916		Adequate	A	Adequate
GSFC –> NSIDC	MODIS, ICESAT, QuikScat	84243	64118	GDAAC → NSIDC DAAC	n/a	88246	88246	88719	Adequate	G	GOOD

Notes: Flow Requirements (from BAH) include TRMM, Terra , Aqua, QuikScat, ~~ADEOS II~~

*Criteria:		
	Excellent	**Total Kbps** > Requirement * 3
	GOOD	1.3 * Requirement <= **Total Kbps** < Requirement * 3
	Adequate	Requirement < **Total Kbps** < Requirement * 1.3
	Almost Adequate	Requirement / 1.3 < **Total Kbps** < Requirement
	LOW	**Total Kbps** < Requirement / 1.5
	BAD	**Total Kbps** < Requirement / 3

Ratings Summary	Apr-05 Req Score	Sep-05 Req Score
Excellent	4	4
GOOD	3	4
Adequate	3	2
Almost Adequate	3	2
LOW	0	1
BAD	0	0
Total	13	13
GPA	2.73	2.77

This graph shows two bars for each source-destination pair. Each bar uses the same actual measured performance, but compares it to the requirements for two different times (October '04, and September. '05). Thus as the requirements increase, the same measured performance will be lower in comparison.



Interpretation: The bottom of each bar is the average measured MRTG flow to a site. Thus the bottom of each bar indicates the relationship between the requirements and actual flows. Note that the requirements include a 50% contingency factor above what was specified by the projects, so a value of 66% would indicate that the project is flowing as much data as requested. The top of each bar represents the sum of the MRTG user flow plus the iperf measurement – it is this value which is used as the basis of the ratings

1) ASF

Rating: **N/A**

Web Page: http://ensight.eos.nasa.gov/Networks/emsnet/ASF_EMS.shtml

Test Results:

Source → Dest	Medians of daily tests (mbps)					
	Best	Median	Worst	User Flow	TOTAL	Integrated
GSFC-CSAFS → ASF	1.38	1.27	1.08	0.01	1.28	1.27
ASF → NESDIS	1.21	0.93	0.54			
ASF → NSIDC	0.16	0.16	0.12			
ASF → GSFC-CSAFS	1.36	1.18	0.72			
ASF→ JPL-SEAPAC	1.38	1.34	0.84			

Comments: Thruput were stable this month to and from all destinations. The approx 1.2 mbps outbound total is as expected for a single T1 (1.54 mbps) circuit, as is the 1.2 mbps inbound. The performance to NSIDC is still low due to the NSIDC switch from EMSnet to PIP in February (previously performance was over 1 mbps -- similar to the other destinations).

Since the requirement from ADEOS has been deleted, the remaining ASF requirements are very low, and are mostly based on estimated ECS interDAAC queries, not production flows. These flow estimates are not considered reliable enough to use as a basis for testing, so the rating is "N/A".

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2) EDC:

Rating: ↑ Low → **Almost Adequate**

Web Page: http://ensight.eos.nasa.gov/Networks/emsnet/EDC.shtml `

Test Results:

Source → Dest	Medians of daily tests (mbps)					
	Best	Median	Worst	User Flow	TOTAL	Integrated
GSFC-PTH → EDC PTH	239.3	226.6	193.5	67.2	293.9	227.3
GSFC-DAAC → EDC LPDAAC	226.4	208.0	91.6			
ERSDAC→ EDC	87.5	87.4	42.2	(via APAN / Abilene / vBNS+)		
EDC → GSFC	130.9	117.3	64.4			

Requirements:

Source → Dest	Date	mbps	Rating
GSFC→ EDC	FY '05	285.4	Almost Adequate
ERSDAC→ EDC	FY '05	20	Good

Comments:

The rating this month is once again based on testing between the GSFC PTH and EDC PTH (last month GSFC-PTH was down, so GDAAC to EDC DAAC was used). The PTH hosts are outside the EDC firewalls, and therefore have higher thruput. The lower thruput between the DAACs was the cause of the lower rating last month – network performance was essentially stable.

The rating is based on the "Integrated" measurement, and as usual is lower than the sum of the MRTG and iperf. The user flow this month had only a very small contribution to the integrated measurement. This 227 mbps value is now below the requirement, but by less than 30%, so the rating improves to "Almost Adequate".

The results from ERSDAC to EDC-PTH (in support of the ERSDAC to EDC ASTER flow, replacing tapes) improved to their present values in April (median was 5.6 mbps in March), after an optical jumper was replaced in the Abilene to NGIX-E connection. The 20 mbps requirement is approximate, based on EDC estimates. This results in a "Good" rating.

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3) JPL:

Ratings: GSFC → JPL: Continued **Excellent**
JPL → GSFC: Continued **Excellent**
LaRC → JPL: Continued **Almost Adequate**

Web Pages:

http://ensight.eos.nasa.gov/Networks/emsnet/JPL_SEAPAC.shtml
http://ensight.eos.nasa.gov/Networks/emsnet/JPL_PODAAC.shtml
http://ensight.eos.nasa.gov/Networks/emsnet/JPL_TES.shtml
http://ensight.eos.nasa.gov/Missions/terra/JPL_MISR.shtml

Test Results:

Source → Dest	Medians of daily tests (mbps)					
	Best	Median	Worst	User Flow	TOTAL	Integrated
GSFC-CSAFS → JPL-SEAPAC	8.6	7.6	2.3	0.9	8.5	7.7
GSFC-MODIS → JPL-PODAAC	4.6	3.5	0.8	0.9	4.4	4.2
LaRC DAAC → JPL-TES	40.5	40.2	27.6			
LaRC DAAC → JPL-MISR	40.8	39.4	24.2			
ERSDAC → JPL-ASTER-IST	87.9	87.7	29.2			
LaRC PTH → JPL-PTH	N/A	N/A	N/A			
JPL-PODAAC→ GSFC DAAC	12.3	11.3	2.9	2.2	13.5	

Requirements:

Source → Dest	Date	Mbps	Rating
GSFC → JPL combined	March '05	1.60	Excellent
JPL → GSFC combined	March '05	0.63	Excellent
LaRC DAAC → JPL-TES	March '05	30.6	Adequate
LaRC DAAC → JPL-MISR	March '05	18.5	Good
LaRC DAAC → JPL-Combined	March '05	40.3	Almost Adequate

Comments:

GSFC → JPL: Performance on this circuit improved from 6 mbps peaks to 8 mbps in late March with a NISN PVC change -- had been mostly stable since the BOP switchover on 15 August '02; well above the requirement; the rating remains "Excellent". The "integrated" data is (like most other sites) just slightly higher than the iperf results alone, and lower than the sum of the median iperf and average MRTG. This again indicates that adding a small average user flow to the median iperf overstates the true situation.

LDAAC→ JPL: This flow was switched to NISN PIP on 10 Feb; MRTG data became unavailable at that time. The LaRC-PTH to JPL-PTH testing also was disabled by this transition, since the LaRC-PTH node switched to PIP, while JPL-PTH remained on EMSnet, and thus did not have connectivity.

Note:the MISR requirement is open to some interpretation. The formal QA flow is only 9.7 mbps – this value is used to generate the "combined" requirement. But the science data also flows on the same circuit. This would push the total MISR flow requirement to 18.5 mbps, and the total LaRC → JPL requirement to 49.1 mbps, which is higher than the circuit speed. This configuration is based on a management decision to reduce cost, in the expectation that both projects' requirements are bursty and include contingency. Thus the actual requirements of both projects are expected to be met with this circuit capacity.

ERSDAC → JPL-ASTER-IST: This new test was initiated in March, via APAN replacing the EBnet circuit. The typical 88 mbps must be well in excess of the requirements.

JPL → GSFC: The requirement from JPL to GSFC includes flows from NASDA and ASF which go via JPL, and includes GSFC and NOAA destinations. Since many of these flows were related to ADEOS, this requirement dropped substantially with the removal of ADEOS. The combined requirement is now only 0.63 mbps, and the combined 12.5 mbps thruput is more than 3 times that, so the rating remains "Excellent".

4) NSIDC:

Ratings: GSFC → NSIDC: ↓ Good → **Adequate**
NSIDC → GSFC: Continued **Adequate**

Web Page: http://ensight.eos.nasa.gov/Networks/emsnet/NSIDC_EMS.shtml

GSFC ←→ NSIDC Test Results:

Source → Dest	Medians of daily tests (mbps)			
	Best	**Median**	**Worst**	**Integrated**
GSFC-PTH → NSIDC-DAAC	91.9	90.8	60.8	
GSFC-DAAC → NSIDC-DAAC	91.5	88.2	40.3	88.7
NSIDC → GSFC-DAAC	17.0	16.9	10.4	

Requirements:

Source → Dest	Date	Mbps	Rating
GSFC → NSIDC	April '05	84.2	Adequate
NSIDC → GSFC	Dec '04	13.3	Adequate

Comments:

GSFC → NSIDC: This flow was switched from EMSnet to NISN PIP on 8 February -- as a result of this switch, the MRTG data became unavailable. The rating is now based on testing from GSFC-PTH to the NSIDC DAAC The iperf and integrated thruput values were stable this month. The requirement, however, varies from month to month, based on planned ICESAT reprocessing. This month the reprocessing IS included, increasing the requirement from 64 mbps last month. Thus although performance was stable, it is no longer 30% above the requirement, so the rating drops to "Adequate".

NSIDC → GSFC: Performance from NSIDC to GSFC was stable this month, and the median remains slightly below 30% above the requirement, so the rating remains "Adequate".

Other Testing:

Source → Dest	Medians of daily tests (mbps)				
	Best	**Median**	**Worst**	**Requirement**	**Rating**
JPL → NSIDC-SIDADS	3.78	3.33	2.61	1.34	Good
GSFC-ISIPS → NSIDC (iperf)	90.4	88.5	57.8		
GSFC-ISIPS → NSIDC (ftp)	22.7	22.2	15.5		
NSIDC → GSFC-ISIPS (iperf)	16.1	15.7	14.1		
ASF → NSIDC	0.16	0.16	0.12	0.73	Bad

Comments:

JPL → NSIDC-SIDADS: This flow switched from EMSnet to PIP on Feb 8, and thruput dropped from 6.1 mbps previously. Thruput remains below 3 x the requirement, so the rating remains "Good".

GSFC-ISIPS ← → NSIDC: Performance from ISIPS to NSIDC was fixed on 8 February, after having problems since July '04. Performance is at nominal levels for the circuit capacity. Testing from NSIDC to ISIPS is stable and gets very similar thruput as NSIDC to GDAAC.

ASF → NSIDC: The median thruput dropped with the switch to PIP last month (was 1.4 mbps). It remains at less than 30% of the requirement, so the rating remains "Bad".

5) GSFC ←→ LaRC:

Ratings: LDAAC → GDAAC: Continued **Good**
GSFC → LARC: Continued **Adequate**

Web Page: http://ensight.eos.nasa.gov/Networks/emsnet/LARC.shtml

Test Results:

Source → Dest	Medians of daily tests (mbps)			
	Best	Median	Worst	Integrated
GDAAC → LDAAC	78.4	72.7	28.1	72.7
GSFC-NISN → LaTIS	79.1	65.7	13.1	
LDAAC → GDAAC	51.1	50.4	24.0	50.4

Requirements:

Source → Dest	Date	Mbps	Rating
GSFC → LARC (Combined)	FY '05	58.5	Adequate
GDAAC → LaRC ECS	FY '05	17.8	Excellent
GSFC → LATIS	FY '05	40.7	Good
LDAAC → GDAAC	FY '05	31.8	Good

Comments:

GSFC → LaRC: The GSFC→ LaRC ECS DAAC flow was switched from EMSnet to NISN PIP on 8 February (GSFC → LaTIS had been flowing on PIP since November). The combined 58.5 mbps requirement had been split as indicated above when the flows were on separate circuits, but is now treated as a single requirement as they are now both on PIP. So the rating is now based on the GDAAC to LaRC ECS DAAC thruput, compared to the combined requirement. MRTG and LaTIS user flow data are also no longer available (but the ECS user flow data was restored in March).

So the GSFC→ LaRC ECS DAAC thruput is now above the combined requirement, but by less than 30%, so the combined rating improves remains "Adequate".

LaRC → GSFC: Performance remained stable with the switch to PIP. The requirement jumped from 6.8 mbps to 31.7 mbps in Oct '03, to incorporate the backhaul of all LaRC science outflow via GSFC. However, most of the LaRC outflow was switched to MAX via SIP in April, improving the performance, so the backhaul portion of the requirement should be removed.

The thruput is more than 30% above this requirement, so the rating remains "Good".

6) NOAA NESDIS:

Rating: Continued **Excellent**

Web Page: http://ensight.eos.nasa.gov/Networks/emsnet/NOAA_NESDIS.shtml

Test Results:

Source → Dest	Medians of daily tests (mbps)					
	Best	**Median**	**Worst**	**User Flow**	**TOTAL**	**Integrated**
GSFC-CSAFS → NESDIS	2.93	2.93	1.65	0.08	3.01	2.93
GSFC-CSAFS → NESDIS via MAX	7.15	6.96	5.04			
ASF → NESDIS	1.21	0.93	0.54			
JAXA (NASDA) → NESDIS	1.42	1.36	0.50			
JPL → NESDIS via MAX	3.31	2.90	2.21			

Requirements:

Source → Dest	FY	Mbps	Rating
GSFC-CSAFS → NESDIS	'05	0.19	**Excellent**

Comments: The dominant flow to NOAA is Quikscat data, from GSFC CSAFS.

Like other sites, the "Integrated" results are lower than the sum of the median iperf and average MRTG Since the integrated thruput is more than 3 times the FY '05 requirement, the rating remains "Excellent".

Note that the flow from JAXA is limited by the TCP window size of the JAXA test source, and the long RTT.

Results from GSFC SAFS to NOAA, via MAX (instead of EMSnet) were also stable, about double the EMSnet performance. Results from JPL, via Abilene to the MAX increased a little, but were still lower than expected. **It is not clear that this flow is allowed under the Abilene AUP.**

7) US ←→ JAXA:

Ratings: JAXA → US: ↓ Excellent → Good
US → JAXA: Continued **Almost Adequate**

Web Pages http://ensight.eos.nasa.gov/Networks/emsnet/JAXA_EOC.shtml
http://ensight.eos.nasa.gov/Networks/emsnet/JPL_SEAPAC.shtml
http://ensight.eos.nasa.gov/Networks/emsnet/GSFC_SAFS.shtml

Test Results:

Source → Dest	Medians of daily tests (mbps)					
	Best	Median	Worst	User Flow	TOTAL	Integrated
GSFC-CSAFS → JAXA-EOC	1.54	1.23	0.74	0.07	1.30	1.39
JAXA-EOC → JPL-SEAPAC	n/a	n/a	n/a			
JAXA-EOC → GSFC-CSAFS	1.46	1.31	0.53			

Requirements

Source → Dest	Date	mbps	Rating
GSFC → JAXA	FY '05	1.67	Almost Adequate
JAXA → US	FY '04, '05	0.51	Good

Comments:

US → JAXA: The requirements above were reduced in November '03, due to the removal of ADEOS flows. They have again been reduced in January '05 (were 2 mbps previously).

Performance has been stable since it recovered on January 13 (thruput had dropped on November 27 to below 1.0 mbps). The rating remains "Almost Adequate".

Notes:

- This case has the integrated thruput is again slightly HIGHER than the sum of the iperf and MRTG – this indicates a problem with the data collection process.
- The requirement still includes 4 ISTs at JAXA for AMSR-E. Each IST has a requirement for 311 kbps, for a total of 1244 kbps. It could be questioned whether JAXA intends to operate all four of the ISTs simultaneously, or whether some ISTs are backups, in which case the network requirements would be reduced to a lower value.

JAXA → US: Performance remained consistent with the reduced ATM PVC. The requirement was reduced in November '03 due to the removal of ADEOS requirements.

Note: JAXA has not yet implemented testing with multiple TCP streams, so performance to GSFC is limited by the TCP window size on JAXA's test machine, in conjunction with the long RTT. In order to reflect the actual capability of network, the rating is normally derived from testing from JAXA to JPL, which uses the same Trans-Pacific circuit, but has a shorter RTT, so will not be limited by the TCP window size. The Trans-Pacific circuit connects into the higher speed domestic EMSnet at JPL, which is not expected to be the limiting factor.

However, this month testing from JAXA to JPL has been down (under investigation). This the rating reverted to the JAXA to GSFC performance, which dropped the rating to "Good".

8) ERSDAC ← → US:

Rating: ↑ Good → **Excellent**

Web Page :http://ensight.eos.nasa.gov/Networks/emsnet/ERSDAC.shtml

Test Results:

Source → Dest	Medians of daily tests (mbps)		
	Best	**Median**	**Worst**
GDAAC → ERSDAC (via APAN)	21.2	15.3	6.4
GSFC ENPL → ERSDAC (via APAN)	89.4	89.0	33.8

Requirements:

Source → Dest	FY	Kbps	Rating
GSFC → ERSDAC	'03 - '05	568	**Excellent**

Comments: Dataflow from GDAAC to ERSDAC was switched to APAN in late February, and the performance above is via that route. MRTG and user flow data are no longer available due to this switch.

The thruput from GDAAC is apparently limited by packet loss at the GigE to FastE switch at Tokyo-XP. The GigE GDAAC source does not see any bottlenecks until this switch (The Abilene and APAN backbones are 10 Gbps), and thus exceeds the FastE output capacity. But the FastE connected GSFC-ENPL node is limited to 100 mbps by its own interface, so does not suffer performance degrading packet loss – it's performance is much higher. Note: EDOS is also FastE connected, and gets the higher performance levels.

The requirement will be revised to include the level 0 flows which used to be sent by tapes, but this value is not known at this time, so the old (primarily ICC) value is used here. Thus the rating improves to "Excellent".

Other Testing: .

Source → Dest	Medians of daily tests (mbps)		
	Best	**Median**	**Worst**
ERSDAC → JPL-ASTER IST	87.9	87.7	29.2
ERSDAC → EDC	87.5	87.4	42.2

The results from ERSDAC to EDC-PTH (in support of the ERSDAC to EDC ASTER flow, replacing tapes) improved to their present values in April (median was 5.6 mbps in March), after an optical jumper was replaced in the Abilene to NGIX-E connection.

ERSDAC → JPL-ASTER-IST: This new test was initiated in March, via APAN replacing the EBnet circuit. The results are much higher than previously via the 1 mbps ATM circuit, and should be considered "Excellent"